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(54) A speed control apparatus for operating a centrifugal atomiser

(57) A speed control apparatus for operating a centrifugal atomiser (10) driven by an air turbine (28), comprises: a first pressurised air line (14) coupled to the air turbine for causing it to rotate at a first predetermined speed; a second pressurised line (33) coupled to an air valve (34), whose outlet is coupled to the air turbine for causing it to rotate at a second predetermined speed; a liquid supply line (30) having an actuable liquid dispense valve (19) for controlling flow of liquid therethrough to the atomiser; and a solenoid valve (36) for substantially simultaneously actuating the air valve (34) and the liquid dispense valve (19). Alternatively the valves (19,34) may be actuated simultaneously by manually-actuated valve (38).

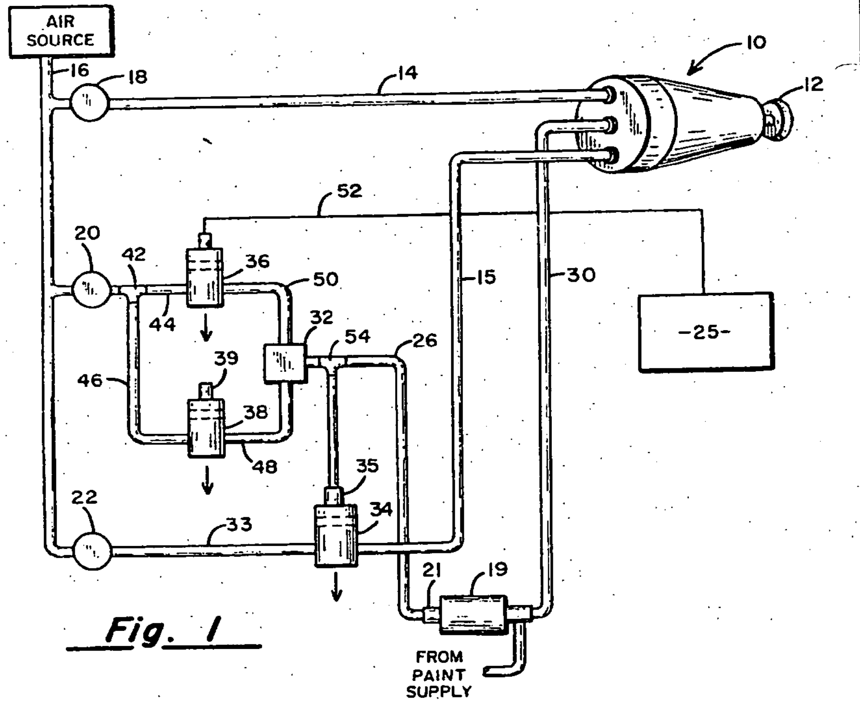

Fig. 1

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SPECIFICATION

A speed control apparatus for operating a centrifugal atomiser

This invention relates to speed control apparatus for operating centrifugal atomisers and in particular, although not so restricted, to centrifugal paint atomisers.

Centrifugal atomisers have long been used in the application of paint to articles. Such atomisers have curved or saucer-shaped discs which are typically driven by air turbine motors at high angular rotations, i.e. 30,000 - 50,000 revolutions per minute (RPM). To achieve such high rates of rotation utilising air turbine motors it is necessary to keep the rotating inertia at a minimum and to utilise precision bearing assemblies so as to minimise friction. The low inertia of such spinning assemblies minimises wear and permits high speed rotation, but is subject to the loading effects of the paint flow therethrough. Typically, paint is applied in a thin column *via* a hose directly to the spinning disc itself, and is centrifugally distributed across the disc and then distributed in finely atomised droplets from the outer circumferential edge of the disc. Thus, when paint is being applied by such a system there is a thin film of liquid paint relatively evenly distributed across the face of the disc. This thin film of paint creates a loading effect on the air turbine motor driving the disc and a consequent reduction in the speed of rotation of the disc. Since the degree of atomisation of the paint is directly related to the speed of rotation of the disc the net result is the atomised paint droplets may be larger than desirable and may provide a thicker or more uneven coating to the article being painted. If the unloaded speed is initially set higher than needed in order to compensate for the slow down during loading there is created a problem in excessive wear of the air turbine motor and its bearings.

Centrifugal atomisers are advantageously used in automatic paint lines, in association with conveyors where articles to be painted are spaced along the conveyor and automatically moved into a paint spray booth enclosing the atomisers. The atomisers are fixedly or movably placed within the spray booth and the paint flow system to the atomisers is selectively timed so as to provide atomising paint in synchronisation with the article as it moves past an atomiser. In applications such as this the atomiser must maintain a relatively high rate of rotation while the conveyor is operating so as to be ready to come into the painting mode, and the movement of the conveyor line, or some control system associated with the conveyor line, causes the paint flow to the atomiser to be controlled.

The present invention is equally applicable to such automatic systems, provision being made for automatically increasing the angular rotation of the atomiser disc at the same time as the signal is developed for turning on paint flow to the atomiser.

According to one aspect of the present invention there is provided a speed control apparatus for operating a centrifugal atomiser driven by an air turbine, comprising: a first pressurised air line arranged to be coupled to said air turbine for causing it to rotate at a first predetermined speed; a second pressurised line coupled to an air valve, whose outlet is arranged to be coupled to said air turbine for causing it to rotate at a second predetermined speed; a liquid supply line having an actuable liquid dispense valve for controlling flow of liquid therethrough to the atomiser; and actuating means for substantially simultaneously actuating said air valve and said liquid dispense valve.

According to another aspect of the present invention there is provided a speed control apparatus for operating a centrifugal atomiser driven by an air turbine, comprising: a source of pressurised air; a first pressure regulator coupled to said source of pressurised air, and a line for coupling said first pressure regulator to said atomiser; a second pressure regulator coupled to said source of pressurised air, and a first air-actuable valve coupled to said second pressure regulator, and a line for coupling said first air-actuable valve to said atomiser; a third pressure regulator coupled to said source of pressurised air, and a solenoid valve coupled to said third pressure regulator; a liquid supply line for coupling to said atomiser, and a second air-actuable valve in said liquid supply line; and air coupling means from said solenoid valve to said first and second air-actuable valves, for substantially simultaneously actuating said first and second air-actuable valves upon electrical energization of said solenoid valve.

The present invention seeks to provide (a) a speed control apparatus to maintain a constant atomising speed on a centrifugal paint atomiser during conditions of no load and full load, and (b) a constant speed centrifugal atomiser wherein additional air pressure is supplied to drive the atomiser only when loading conditions demand such additional pressure.

The invention is illustrated, merely by way of example in the accompanying drawings, in which:-

Figure 1 is a schematic view of a speed control apparatus according to the present invention for a centrifugal atomiser; and

Figure 2 shows a centrifugal atomiser for use with the speed control apparatus of Figure 1.

Referring to the drawings, there is shown an embodiment of a speed control apparatus according to the present invention. A centrifugal atomiser 10 is preferably positioned in a spray booth also having a movable conveyor line therein (not shown). The atomiser 10 is positioned in proximity to the conveyor line so that articles carried by the conveyor pass in front of a disc 12. The disc 12 is connected to a high speed rotating air turbine 28, as shown in Figure 2, for high speed rotation. A pressurised air line 16 is connected to a source of air pressure, typically in the range of 20,000 kg/m^2 to 100,000 kg/m^2 (30 to 150 p.s.i.). The air line 16 is connected to three air pressure regulators 18, 20 and 22. These regulators are of the type commonly used in the industry, as for example Model R10, manufactured by Watts Regulator Company. The regulators 18, 20, 22 may be manually set to provide a regulated air pressure at the respective output lines.

A first air inlet line 14 is coupled between the ism which controls not only the operation of the atomiser but also the operation of the conveyor line according to variable conditions.

CLAIMS

1. A speed control apparatus for operating a centrifugal atomiser driven by an air turbine, comprising: a first pressurised air line arranged to be coupled to said air turbine for causing it to rotate at a first predetermined speed; a second pressurised line coupled to an air valve, whose outlet is arranged to be coupled to said air turbine for causing it to rotate at a second predetermined speed; a liquid supply line having an actuable liquid dispense valve for controlling flow of liquid therethrough to the atomiser; and actuating means for substantially simultaneously actuating said air valve and said liquid dispense valve.

2. An apparatus as claimed in claim 1 in which said actuating means comprises a solenoid valve connected to said air valve and said liquid dispense valve.

3. An apparatus as claimed in claim 2 in which said actuating means includes a manually actuable valve connected in parallel across said solenoid valve.

4. An apparatus as claimed in any preceding claim including a first pressure regulator coupled to said first pressurised line, and a second pressure regulator coupled to said second pressurised line.

5. An apparatus as claimed in claim 4 when dependent on claim 2 or 3 including a third pressurised line having the solenoid valve therein, and arranged to permit said third pressurised line to actuate substantially simultaneously said air valves and said liquid dispense valve.

6. An apparatus as claimed in claim 5 including a third pressure regulator coupled to said third pressurised line.

7. An apparatus as claimed in claim 6 including a common pressurised air source coupled to said first, second and third pressure regulators.

8. A speed control apparatus for operating a centrifugal atomiser driven by an air turbine, comprising: a source of pressurised air; a first pressure regulator coupled to said source of pressurised air, and a line for coupling said first pressure regulator to said atomiser; a second pressure regulator coupled to said source of pressurised air, and a first air-actuable valve coupled to said second pressure regulator, and a line for coupling said first air-actuable valve to said atomiser; a third pressure regulator coupled to said source of pressurised air, and a solenoid valve coupled to said third pressure regulator; a liquid supply line for coupling to said atomiser, and a second air-actuable valve in said liquid supply line; and air coupling means from said solenoid valve to said first and second air-actuable valves, for substantially simultaneously actuating said first and second air-actuable valves upon electrical energisation of said solenoid valve.

9. A speed control apparatus for operating a centrifugal atomiser substantially as herein described with reference to and as shown in the accompanying drawings.

10. A speed control apparatus as claimed in any preceding claim in combination with a centrifugal atomiser.

11. A speed control apparatus for operating centrifugal atomisers, of the type driven by an air turbine, comprising a first pressurised air line coupled to said air turbine for providing a rotational drive force at a first predetermined speed; a second pressurised line coupled to an air valve, the outlet of said air valve coupled to said air turbine for providing a rotational drive force at a second predetermined speed; a liquid supply line to said atomiser, said supply line having coupled thereto an actuable liquid dispense valve for controlling the flow of liquid therethrough; and means for substantially simultaneously actuating said air valve and said liquid dispense valve.

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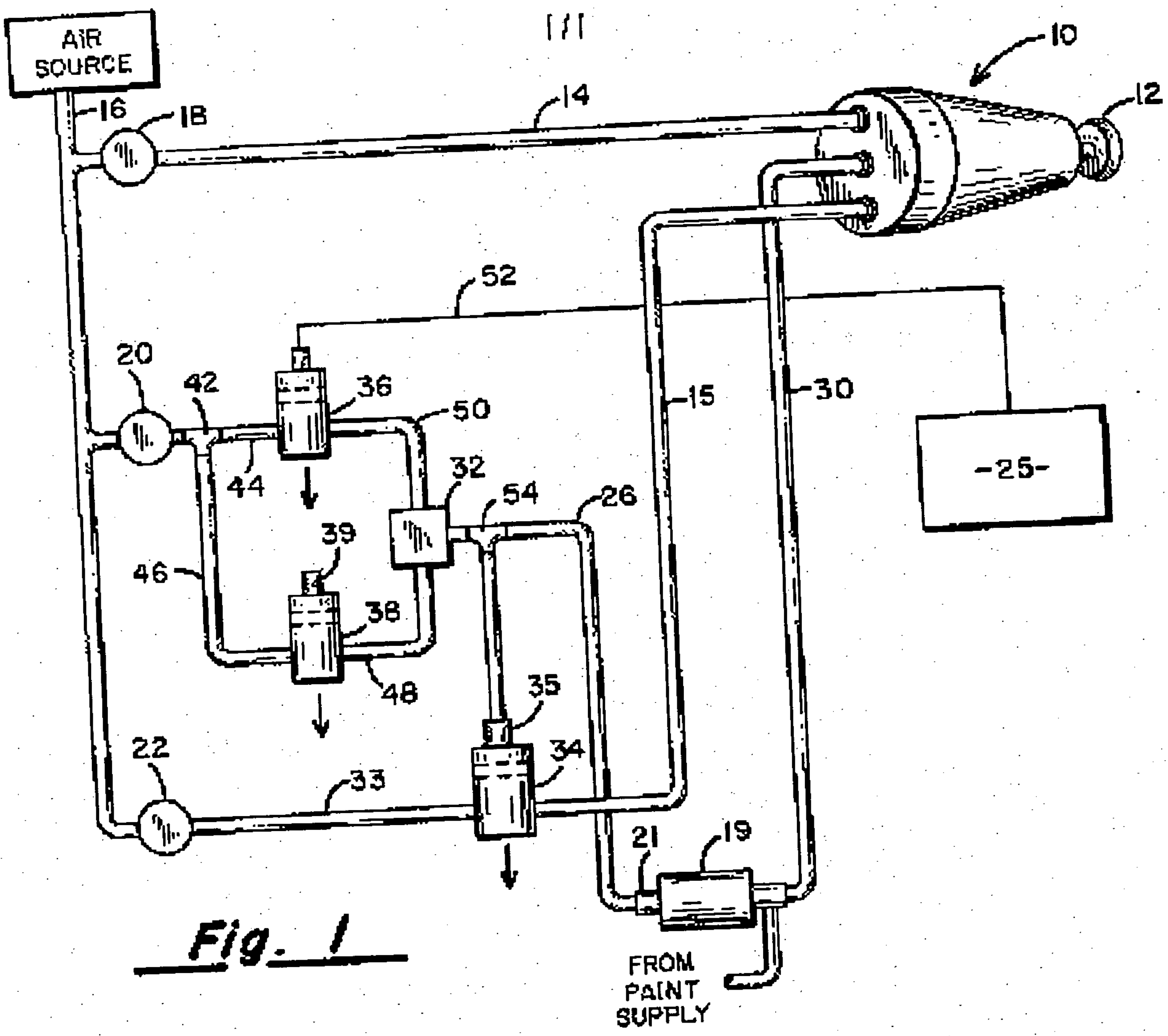
AIR SOURCE
-25-
FROM PAINT SUPPLY

Fig. 1

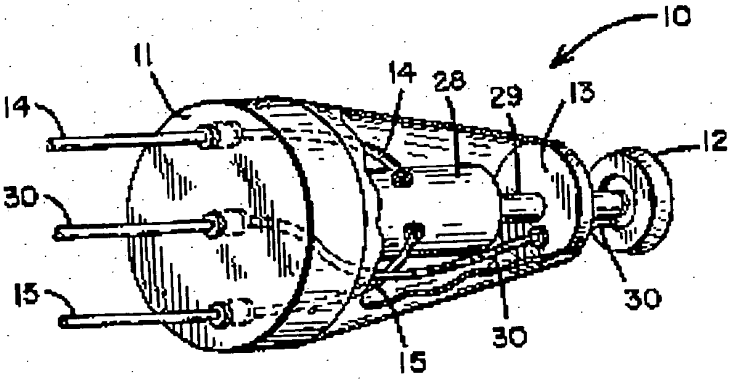

Fig. 2